

day a depression of great energy but of very slight diameter moved in a northerly track toward Norfolk. On the 10th, curving slightly to the northeast the storm passed beyond the coast. Cautionary signals were ordered in advance of this storm on the 9th from Smithville to Sandy Hook, and were justified by the following maximum velocities: Smithville, 60 NE.; Wilmington, 64 W.; Macon, 50 SW.; Hatteras, 42 SW.; Kittyhawk, 40 S.; Cape Henry, 35 SE.; Norfolk, 25 SE.; Chincoteague, 32 SE.; Barnegat, 28 N.; Sandy Hook, 30 NE.

No. IV.—This storm, which pursued a very anomalous track, was first evident in Texas, where on the 14th it moved in a track nearly due east. At the midnight observation, while the storm centre was near New Orleans, a barometric depression extended from the Gulf of Mexico to the Lake Superior region. At the same time the high pressure No. III, before described, prevailed with fair weather in New England. These conditions were unfavorable to an eastern progress of the storm, and on the 15th the depression moved in a northerly course to Lake Michigan. At the end of this day the pressure had not yielded in New England, and had begun to fall in the Northwest, the lowest barometers reported were, Chicago, 29.42; Grand Haven, 29.44; Milwaukee, 29.36, all more than 0.6 inch below the normal. On the 16th, with diminishing energy, the storm centre moved into Iowa and Minnesota, and on the 17th into Manitoba. The track on the 16th and 17th is very remarkable, and probably for a storm of such energy has no parallel in the history of the Signal Service. Cautionary signals were displayed on the 14th from Indianola to Pensacola, and on Lakes Michigan, Superior and Huron, and on the 15th on Lakes Erie and Ontario. The following maximum velocities were reported: Indianola, 40 N.; Galveston, 28 N.; Port Eads, 28 S.; Pensacola, 38 S.; Mobile, 28 SE.; Duluth, 78, NE.; Marquette, 30 S.; Milwaukee, 38 SW.; Grand Haven, 30 SE.; Alpena, 26 W.; Port Huron, 27 W.; Detroit, 39 SE.; Sandusky, 30 SW.; Cleveland, 26 SE.; Erie, 37 SE.; Rochester, 35 E.

No. V.—On the 23d, a depression exhibiting slight energy moved across Dakota into Minnesota. On the 24th, turning more to the north of east it moved with increased energy beyond the Lake Superior region. Nearly all the rain accompanying this storm was confined to the Northwest and the Upper Lake region. Cautionary signals were in general justified by the following maximum velocities: Duluth, 25 SW.; Marquette, 26 S.; Milwaukee, 34 SW.; Chicago, 27 SW.; Grand Haven, 33 SE.; Alpena, 36 S.; Port Huron, 27 S.; Detroit, 28 SW.; Toledo, 31 SE.; Sandusky, 32 SW.; Cleveland, 28 S.

No. VI.—On the 25th a depression developed in Wyoming and Nebraska. On the 26th, the low area, showing but slight energy, moved into Wisconsin. On the 27th it advanced to the eastward beyond the lakes and on the 28th it disappeared beyond the Gulf of St. Lawrence. At no portion of its track did it become a storm of any violence. Its passage was accompanied by light rain fall, which extended to New England.

No. VII.—On the 28th, a low area developed in Dakota, which, on the 29th, moved in a northeasterly track across Minnesota. South of the track of the centre of depression there were sharp barometric gradients and considerable storm energy. The lowest pressures reported were: Omaha, 29.42; Fort Bennett, 29.38; Moorehead, 29.4; St. Paul, 29.46; Duluth, 29.3—all more than 0.6 inch below the mean. Cautionary signals, which had been ordered for the previous storm (No. VI) were kept displayed in consequence of danger menaced by the appearance of the new storm centre.

INTERNATIONAL METEOROLOGY.

International charts, Nos. V and VI, accompany the present REVIEW. The former is published for July, 1879, and continues the series of this chart commenced in January, 1877. Chart No. VI is prepared for the month of October, 1879, and continues the series of this chart commenced in November, 1877.

Chart No. V shows the mean pressure, temperature and the prevailing direction of the wind at 7.35 a. m., Washington, or 0.43 p. m., Greenwich mean time, for the month of July, 1879, over the Northern and at certain isolated stations in the Southern Hemisphere. To the areas of low pressure for the present month there attaches considerable interest, owing to their strikingly irregular boundaries over northern Europe. It will be observed, upon examination of the chart, that the lowest mean pressures are to be found over northern Hindostan, as indicated by the isobar of 29.50. Thence northward over the Himalayas and the western portion of the Chinese Empire, the barometer rises to 29.60, and north of Toorkistan and the Province of Tomsk, comprising the valley of the Obi and its tributaries, the pressure again rises to 29.70. Northwest of this locality, and within very narrow and irregular limits, the area of 29.70 passes over central Russia, southern Scandinavia and the northern portion of the British Isles. Between the meridians of 10° E. and 10° W., two small areas of 29.60 appear, one over the Shetland Islands and the other over the Hebrides. The area of 29.70 probably reaches the Asiatic coast in the vicinity of Pekin, but from lack of reports from central and eastern Siberia the lines on the coast cannot be connected with those of the interior. In Manitoba and along the southern shores of Hudson's Bay the barometer falls to near 29.80, and in one instance to 29.78 at Pembina, Dakota. Over the United States, west of the 100th meridian, the pressure is generally above 30.00; to the eastward and north of the 40th parallel, including Texas and Indian Terri-

tory, the barometer averages about 29.95. Between the parallels of 50° and 60° N., the pressure ranges from 29.55 to 29.95, and from 60° to 70° N., from 29.55 to 29.91. Over Asiatic Turkey and Persia, it falls below 29.80, with probably an area of 29.70 over Arabia. Over Hindostan the pressure ranges from 29.41 at Lahore to 29.71 at Poonah. The area of highest pressure, 30.30, covers the ocean between 30° and 40° N., and 20° and 50° W. The area of 30.10 occupies about three-fourths of the ocean between the parallels of 20° and 50° N., and the meridians of 10° and 70° W. The area of 30.00 occupies the southeastern portion of the United States and the extreme southwestern portion of Europe; the barometer over the latter being generally below 29.90. The following are the highest readings from isolated stations: Angra, 30.33 (770.3); Ponta, Delgado, 30.31 (769.8); Capetown, 30.16 (766.0); Funchal, 30.14, (765.5); Mauritius and Melbourne, 30.13 (765.2); Mexico, 30.10 (764.4). The extreme monthly range of mean pressure is 0.94 inch, which is 0.03 inch smaller than July, 1878, and 0.02 inch larger than July, 1877. The following monthly mean temperatures are given in Fahrenheit's scale: lowest Godthaab, 44°; Ft. St. Michaels, 47°; Stykkisholm, 51°; York Factory, 55°; Nikolaievsk on the Amoor and Moose Factory, 60°: highest, Lahore, 99°; Laghouat, 98.01; Nukuss, 90.07; Tiflis and Tashkend, 90.05; Beirut, 90°. The prevailing direction of the winds over the United States, was *southwesterly* in the Atlantic east states, *southerly* over the interior and in the Plateau regions, *westerly* in the Northwest and Lake region, and variable on the Pacific coast. Over the Atlantic ocean, *northeast to southeast* and *southwest* south of parallel 40° N., and to the northward from *southwest* to *northwest*. Over Europe, *northerly* in Scandinavia, *northwest to southwest* over the British Isles, *westerly* in the interior, and *north to west* in Italy. In Algeria, *variable*. In Hindostan, *southwest to northwest*. Along the Asiatic coast, *southeast to southwest*. Compared with July, 1877 and 1878, the temperature over the United States agrees very closely in the interior, but is somewhat lower along the northern boundary, in the Southern Plateau and Southern Pacific coast regions, and higher along the Gulf coast. The pressure is slightly higher to the south and east and in the Lake region and Northwest, elsewhere about normal. Over the Atlantic ocean where comparison can only be made with 1878, the pressure at the central area of high (in the vicinity of the Azores) is from 0.01 to 0.03 inch higher. The area of 30.10 has moved considerably to the southeast, causing a marked fall along the western coasts of France and the British Isles, and over the Bay of Biscay. Off the eastern coast of the United States, the changes in temperature and barometer are very slight. North of parallel 50° there is a marked rise in the barometer west of 30° W., but a decided fall to the eastward. With regard to temperature the changes are unimportant except in the last named locality, where there occurred a fall of from 3° to 5°. In Europe the greatest changes in pressure occur in the central and southern portions and over the British Isles, where in the latter a decided fall is reported of from 0.05 to 0.30 inch. This deficiency extends southward over Algeria, and eastward through Russia to Central Siberia; thence to the Asiatic coast, there was first a rise and then a fall, the latter occurring along the China coast. Accompanying this general diminution of pressure there is a considerable rise in temperature, except over the British Isles, where a fall of from 2° to 4° occurs. In Hindostan, there is a general but slight fall in pressure, accompanied by a corresponding rise in temperature. The accompanying table shows the deviations in temperature and barometer at isolated stations for the month of July, 1879, as compared with the means of the past two years.

Comparative Thermometric and Barometric Means, with corresponding Departures.

STATION.	Mean Temperature.			Mean Barometer.			STATION.	Mean Temperature.			Mean Barometer.		
	July, 1877-78.	July, 1878.	Departure.	July, 1877-78.	July, 1878.	Departure.		July, 1877-78.	July, 1878.	Departure.	July, 1877-78.	July, 1878.	Departure.
York Factory	58.2	54.8	-3.6	29.75	29.80	+0.15	Ponta Delgado	74.4	78.6	+4.2	30.34	30.31	-0.03
Ft. St. Michaels	49.1	47.2	-1.9	29.82	29.86	+0.04	Angra	72.4	74.3	+1.9	30.33	30.33	Norm'l
Godthaab	44.2	44.1	-0.1	29.74	29.91	+0.17	Bridgetown	83.0	81.2	-1.8	29.99	29.98	-0.01
Stykkisholm	51.7	51.1	-0.6	29.73	29.86	+0.13	Navassa	82.7	81.3	-1.4	29.92	29.98	+0.06
Tromsø	53.9	56.1	+2.2	29.73	29.78	+0.05	Medellin	67.4	68.1	+0.7			
Thorshavn	54.6	53.1	-1.5	29.76	29.74	-0.02	San Jose de Costa Rica	66.2	66.7	+0.5			
Archangel	61.3	59.7	-1.6	29.97	29.72	-0.25	Mexico	59.3	56.3	-3.0	30.10	30.06	-0.04
Ekaterinburg	71.1	70.9	-0.2	29.66	29.63	-0.03	Melbourne	48.6	46.8	-1.8	30.15	30.13	-0.02
Barnaul	70.0	79.5	+9.5	29.65	29.59	-0.06	Hobart Town	51.8	42.3	-9.5	29.95	29.95	+0.03
Yeniseisk	70.4	76.8	+6.4	29.58	29.70	+0.12	San Jose de Puerto Rico	82.8	83.1	+0.3	29.98	30.05	+0.07
Nikolaievsk, on the Amoor	57.5	59.7	+2.2				Nassau	83.8	84.0	+0.2	30.03	30.06	+0.03
Pekin	81.8	78.8	-3.2	29.65	29.64	-0.01	Havana	82.5	82.5	Norm'l	30.02	30.04	+0.02
Zi-Ka-Wei	77.6	80.8	+3.2	29.75	29.71	-0.04	Astrakhan	85.2	87.8	+2.6	29.79	29.79	Norm'l
Tokel	77.1	76.3	-0.8	29.87	29.90	+0.13	Athens	87.7	89.6	+1.9	29.90	29.84	-0.06
Tashkend	86.9	80.5	-6.4	29.78	29.60	-0.18	Lahore	97.4	99.1	+1.7	29.44	29.41	-0.03
Nukuss	89.9	90.7	+0.8	29.76	29.75	-0.01	Tiflis	88.4	90.5	+2.1	29.75	29.74	-0.01
Beirut	89.6	90.3	+0.7	29.78	29.73	-0.05	Laghouat	97.9	98.1	+0.2	30.10	29.98	-0.12
Mauritius	71.7	72.1	+0.4	30.18	30.13	-0.05	Monach Lighthouse	58.9	54.2	-4.7	29.85	29.55	-0.30
Fort Napier	69.6	63.7	-5.9	30.01	30.01	Norm'l	Fort de France	80.8	79.7	-1.1	29.89	29.86	-0.03
Cape Town	61.0	61.4	+0.4	30.12	30.16	+0.04	Yokohama	77.4	76.7	-0.7	29.83	29.90	+0.07
Free Town	81.4	79.7	-1.7	30.02	29.98	-0.04	Li-hon	77.0	75.0	-2.0	30.07	30.10	+0.03
Paramaribo	82.9	79.8	-3.1	30.03	30.02	-0.01	Madrid	88.3	90.1	+1.8	29.94	29.89	-0.05
Funchal	74.4	74.8	+0.4	30.16	30.14	-0.02	Cagliari	82.9	79.0	-3.9	29.96	29.98	+0.02

Chart No. VI.—This chart displays the tracings of the probable courses of twenty-three of the principal storm areas of the Northern hemisphere for the month of October, 1879. The approximate paths of progressive movement are based upon daily simultaneous international observations to the number of over 650, besides a large mass of irregular data which reaches this office in various ways from logs of vessels of the merchant marine of the North Atlantic ocean. Concerning the general distribution of the paths of the areas of low barometer the following is given: Only three areas were confined within the boundaries of North America, although six others crossed portions of that continent, two coming from the Pacific, two from the Atlantic, one from the Rocky Mountain region between the parallels of 40° and 50° N., and one from Manitoba, the latter crossing the ocean to the mainland of Europe. Three areas were confined to the Atlantic between the 30th and 50th parallels. Seven areas reached the mainland of northern Europe from the Atlantic between the parallels of 60° and 70° N. Two areas were confined to southern Europe, one to the Bay of Biscay and northern Spain and one to southern Russia. Of the storms of North America the following descriptions are given: No. I formed over the northern Rocky Mountain region on the 1st and moved thence northeastward during the day to Lake Superior, accompanied by brisk south to west winds and light rains. During that portion of the storm's course eastward over Canada and the Marine Provinces, fresh to brisk winds were experienced, with the centre of depression moving very rapidly and accompanied by slight precipitation. By morning of the 4th the depression, with considerably diminished energy, had reached the Atlantic in the vicinity of 50° N., 50° W., followed over the Maritime Provinces by brisk to high westerly winds and rapidly rising pressure; on this and the preceding day there began the formation of an area of barometric minima over the ocean between the parallels of 40° and 50° N. and the meridians of 30° and 60° W., which continued about stationary until the 29th; 4th, in 47° , $30'$ N., 45° W., 29.73 W. force 6, on the Banks of Newfoundland. steamship *Alabama* took heavy northerly gales which lasted until the 12th; in 50° , $46'$ N., 26° , $08'$ W., WSW., S. and NW. fresh to strong gales and high sea; in 49° , $05'$ N., 27° , $09'$ W., S. and NW., strong gales. 5th in 50° , $18'$ N., 32° , $13'$ W., NNW. to WSW., fresh gales to moderate breezes, high seas; in 44° $50'$ N., 42° , $50'$ W., strong SW. gales; in 45° , $35'$ N., 50° , $10'$ W., 29.83, NNW., force 8, rain. 6th in 46° , $38'$ N., 39° , $44'$ W., SW. to NW., fresh to strong gales, clearing away at 8 p. m.; in 51° , $10'$ N., 31° , $36'$ W., fresh to moderate S. to SE. gales, with rain. 7th, in 48° , $36'$ N., 33° , $20'$ W., strong SE. gales with hard squalls, torrents of rain and heavy seas sweeping decks; in 51° N., 37° W., 29.80, S., force 3, rain. Area No. V, to be described further on, is in all probability a continuation of this storm. No. III. After the passage of area No. I to the Lake Superior region the barometer again fell over Montana and Wyoming, developing on the 3rd an area of slight energy which moved rapidly northeastward to Manitoba, where on the morning of the 4th the lowest barometer, 29.64, occurred at Fort Garry. On the 5th this area gradually filled up over Hudson's Bay. No. IV. This area first appeared over the Pacific ocean on the 3rd in the vicinity of 44° N., 140° W., and moving thence slowly eastward, reaching the coast of Oregon and Washington Territory on the morning of the 6th; Olympia, 29.43, S. rain; Portland and Roseburg, 29.45, SSE. and SE., cloudy. During the day the depression moved southeastward and on the following morning was central between Virginia City, Montana and Salt Lake City; barometer at former 29.33, wind NW., at latter 29.55, S. Morning of the 8th, central with lower pressure in the Middle Rocky Mountain slope; North Platte, 29.22, SE; Dodge City, 29.36, S.; Cheyenne, 29.76, NW.; Denver, 29.73, NE. With increased energy the depression moved northward to Manitoba, where on the morning of the 9th the lowest barometer, 29.44, was reported from Fort Garry; rain, with fresh to brisk winds, prevailed along the northern border of the country eastward from the 100th meridian to the Pacific coast. On this morning a barometric trough extended southward from Manitoba to the Rio Grande valley, with the lowest reading at North Platte, 29.29, wind NNW. High winds were experienced at Rocky Mountain stations as follows: Pike's Peak, SW. 78 miles; Cheyenne, W. 50 miles. During the 9th the pressure rapidly recovered to the south and west and on the morning of the 10th the centre of depression lay to the north of Manitoba, where during the day it disappeared over Hudson's Bay. No. IX.—With a very sudden and rapid fall in the barometer, this depression appeared on the Oregon coast on the morning of the 11th. During the two following days the area passed southeastward into northern New Mexico, followed over Nevada by cold northwesterly winds and light snow at places. On the 14th the depression curved to the north-northeast, being central in Colorado on the following morning with a decided fall in pressure. By morning of the 16th, was central in the Upper Missouri valley from whence its course changed to the east-southeast, uniting with area No. VIII on the 17th in central Wisconsin. Accompanying this combination there was in consequence no marked change in the barometer or coincident increase of wind velocity. The central area still remained within the isobar of 29.60 and light rains, with fresh to brisk winds prevailed over Lakes Michigan and Superior. On the 18th, with increasing pressure the area was central over the Province of Ontario, followed over the Upper Lakes by brisk to high westerly winds and accompanied over the Lower Lakes and Province of Quebec by fresh to brisk southeast to southwest winds and light rains. Morning of the 19th, central over eastern Maine and New Brunswick, lowest barometer at Chatham and Eastport, 29.68 and 29.69

respectively. 20th, central with diminished pressure over the ocean south of Newfoundland in vicinity of 43° N., 60° W. and thence northeastward over Newfoundland the barometer ranged from 29.12 to 29.72, lowest at St. Pierre, N. F., with west and northwest winds varying in force from 3 to 9. The isobar of 29.60 inclosing the central depression on this day extended northeastward over Iceland, thence southeastward over Ireland to northern Italy and again northeastward over central Russia to northwestern Siberia, north of which line the pressure rapidly diminished to the Arctic ocean. On Cariboo Island, N. S., violent northwest storm all day, several vessels wrecked; in 46° , $36'$ N., 55° , $23'$ W., S. S. *Faraday*, 29.20, violent westerly gale; in 41° , $25'$ N., 56° , $30'$ W., S. S. *Spartan*, heavy NW. gale for 24 hours; in 40° N., 57° W. violent W. and NW. gales. 21st, depression central east of Newfoundland; at St. Johns, 29.36 W. strong, a fall of 0.15 inch in past 24 hours; St. Pierre, N. F., 29.56 NW.; in 43° , $50'$ N., 55° W., 29.87, NW., force 6, rain; in the vicinity of 40° N., 69° W., the barometer rose from 0.40 to 0.50 inch in 24 hours, wind steady northwest; in 45° , $12'$ N., 52° , $20'$ W., S. to NW. fresh gale, heavy sea; in 48° , $56'$ N., 39° W., SSW. to WSW. strong gales, high seas; in 45° , $43'$ N., 51° , $19'$ W., SSW. to W., increasing to moderate gale; 22nd, central in about 55° N., 35° W., barometer generally below 29.75. On the following day combined with area No. XV, then central northwest of Iceland; barometer at Stykkisholm 29.25, SE., force 6, rain. No. VIII.—This storm of cyclonic origin first appeared over the Caribbean sea, in the vicinity of 15° N., 65° W., during the 10th and 11th. During the 24 hours preceding the morning of the 12th, the pressure at all West India stations east of Havana fell from 0.02 to 0.05 inch, winds shifting from east to southeast; up to the 13th, land stations, so far as shown upon our charts, gave but little indication of the development of the storm, the narrow diameter of the central area being as usual well marked. Reports from Havana on the 12th stated that there were indications, from incoming vessels, of a severe cyclone to the southeast. The following reports on the 12th show more clearly the effect of the approaching storm from the relative disposition of wind directions and the heavy rainfalls than the accompanying distribution of pressure. S. S. *Vandalia*, Chiriqui, C. A., 29.85, SW.; Navassa, 29.79, SE., rain, 2.59 inches rain-fall in past 24 hours; Santiago de Cuba, 29.79, SE., cloudy; Kingston, Jamaica, 29.99, SE., cloudy, 8.10 inches rain-fall in past 24 hours; Nassau, 29.92, NE., fair; Havana, 29.86, NE., cloudy; 13th, Kingston, Jamaica, 30.04, SE., rain, 5.50 inches rain-fall in past 24 hours; Navassa, 29.76, E., threatening, 1.50 inches rain-fall in past 24 hours; Santiago de Cuba, 29.83, SE., no report of weather; Havana, 29.75, E., cloudy; Key West, 29.85, E., heavy rain; Nassau, 29.91, NE., cloudy. Schooner *Olive Branch* wrecked at Barnett Point, Great Bahamas. Sandy Cay, Great Bahamas, bark *Pahona* stranded at 1.30 p. m., during a heavy easterly gale. Cienfuegos, Cuba, at 6 p. m., barometer fell to 29.65, lowest, then rose gradually to 29.90 on the 18th; wind NE. from the 10th to 10 p. m. of the 13th, when it changed to ESE. and SE.; Baracoa, Cuba, barometer fell from 29.84 at 9 a. m., of the 10th to 29.67 by 4 p. m., of the 12th, then rose to 29.84 by 9 a. m. of the 14th; wind ESE. on the 10th, 11th, and up to 9 a. m. of the 12th, at 4 p. m. changed to SSE; 13th S., fresh and squally. Sagua la Grande, Cuba, barometer fell from 29.88 at 8 a. m. of the 12th to 29.72 by 4 p. m. of the 14th, and then rose to 29.90 by 8 a. m. of the 16th; wind E., force 5 to 7 on the 12th and 13th; ESE. and SE., force 5 and 6 on the 14th; SSE. to S. force 2 to 6 on the 15th. 14th, depression appeared to be central over the southwestern portion of Cuba, Havana, 29.65, E., light rain; in 24° N., 84° W., 29.64, NE., force 8, cloudy; Key West, 29.74, E., light rain, 3.29 inches rain-fall in past 24 hours; Punta Rassa, 29.86, a fall of 0.07 inch in past 24 hours, NE., light rain; Kingston, Jamaica, 30.11, SE., cloudy, 4.80 inches rain-fall in past 24 hours. 15th, central over the eastern portion of the Gulf of Mexico, in about 25° N., 85° W. Havana, 29.73, SE., cloudy; Key West, 29.75, SE., cloudy; Punta Rassa, 29.76, E., light rain; Kingston, Jamaica, 30.17, hazy, 3.40 inches rain-fall in past 24 hours. Along the northern Gulf coast the winds were northeasterly, with occasional light rains, and the barometer had fallen from 0.09 to 0.20 inch since the morning of the 14th. 16th, depression central with diminished energy, in southern Mississippi; Mobile, 29.62, W., cloudy; New Orleans, 29.73, NW. cloudy; Montgomery, 29.69, SE. light rain, 2.19 inches in past twenty-four hours; St. Marks, 29.83, E., cloudy, 2.93 inches in past twenty-four hours. During the day area passed northward over the Mississippi valley, combining with area No. IX, then central in Wisconsin on the morning of the 17th. No. XVII.—Following closely upon an area of high pressure (30.30) which succeeded the passage of area No. IX, the winds shifted from NW. to S. with a decided fall in pressure over Manitoba by morning of the 19th. By morning of the 20th the barometer at Fort Garry had fallen from 30.32 on the 18th, to 29.69, and the isobar of 29.80 included nearly the whole of the extreme Northwest. 21st, central in the northern portion of the Upper Mississippi valley, but accompanied by no precipitation. 22nd, central over Lake Superior; Marquette, 29.69, W., fair; Duluth, 29.86, NW., light rain; Moose Factory, 29.67, S., fair. 23d, central with decreased pressure over the Province of Quebec, and by the following morning reached the Gulf of St. Lawrence; lowest barometer at Charlottetown P. E. I., 29.56; light to heavy rains prevailed in New Brunswick, Nova Scotia and adjoining islands. On this day accompanying the rapid rise in barometer over the Province of Ontario, light to heavy snow fell at several stations, with winds shifting to northwest and the thermometer ranging from 25° to 31° . During the 24th and 25th, area passed northeastward to near 60° N., 40° W. The

following reports from Godthaab show the effect of the northward movement of the storm: 24th, 29.45, a fall of 0.42 inch in past twenty-four hours, wind S., cloudy; 25th, 29.14, NE., cloudy; 26th, 29.38, SSE., cloudy; 27th, 29.42, calm. During the approach and passage of the depression over Iceland, the following reports from Stykkisholm show the effect: 26th, 29.60, a fall of 0.47 inch in past twenty-four hours, wind S., force 9, rain; 27th, 29.65, W., force 9; 28th, 29.78, SW., force 2. On the 28th Thorshavn reported a fall of 0.14 inch in the barometer, winds shifting from SW. to W., and at North Ust, a fall of 0.12 inch. Rain began on the Norway coast with a fall in pressure of from 0.07 to 0.20 inch. 29th, depression probably central over northern Lapland; Tromso, 29.52, WSW., cloudy. 30th, central over the White Sea; Archangel, 29.59, a fall of 0.25 inch in past twenty-four hours. During the 31st disappeared in a high pressure area (30.40) then prevailing over Siberia. No. XX.—During the prevalence of an extremely high pressure area (30.80) over the Middle Atlantic States, and (30.60) over the South Atlantic States on the 25th and 26th, the barometer, over the central portion of the Gulf of Mexico, fell below 29.90. Bark *Henrietta*, 150 miles SSE. of Port Eads, La., experienced during the 26th and 27th, heavy gales from ESE. to NE., with fearful sea. Brig *Sally* left Pensacola, Fla., for Havana, on the 25th; 26th, wind increased to a terrific gale, heavy seas sweeping decks; 27th, vessel thrown on beam ends about 8 a. m. and capsized about one hundred miles SE. of South Pass Light, six sailors lost; sea continued very rough and dangerous throughout the 28th. As early as the 24th, reports from Havana stated that there were indications of a cyclone forming to the northwest. Schooner *L. B. Wing*, from Pascagoula to Sagua la Grande was struck by a violent easterly gale on the afternoon of the 25th and became water-logged. 27th, along the northern Gulf coast, the wind changed to NE. and N. with light rains, barometer still above 30.20; in 23°, 45' N., 90°, 15' W., 29.92 S.; Key West, 29.98 E., 3.33 inches rain-fall in past 24 hours; in 26° N., 86° W., bark *Jennie Armstrong*, 26th, struck hurricane from E. and was compelled to send before it under bare poles; 27th, gale changed to NE., which drove the vessel back off Galveston harbor. In 16° N., 87° W., 27th, schooner *Mary Erelia* encountered violent southwesterly gale, lost sails and sprung a leak. Brig *Nellie*, 24 miles off Southwest Pass, lost sails and sprung a leak during violent easterly gales. During the day the depression passed rapidly northeastward across northern Florida to the Atlantic, the barometer along the South Atlantic coast, falling from 0.25 to 0.60 inch, winds NE. and N. Heavy gales were experienced over the ocean west of the 70th meridian. In 31°, 47' N., 71°, 16' W. brig *Victoria* experienced hurricane from SW. to WNW. lasting 3 days, lost sails. In 32° N., 73° W. brig *John Wesley*, hurricane from SE. backing to NE. and N. and again around the compass, lasting 18 hours. 28th, depression probably central off the North Carolina coast; Cape Hatteras, 29.79 NE. light rain, a fall of 0.61 inch and 3.18 inches rain-fall in past 24 hours. In 37° N., 57°, 30' ship *Red Cloud* in hurricane from SSE. lost sails. 60 miles north of the Bermudas, brig *Terifa* had terrific gale from SE. to SW. with heavy cross seas throwing vessel on beam ends and forced to run before the gale for 8 hours. In 39° N., 66° W. heavy gale from E. to S. veering to WNW. and continuing for 40 hours. During the day depression passed rapidly northward off the Middle Atlantic coast and by morning of the 29th had combined with area No. XXI then central on the New England coast. No. XXI. On the 26th there were indications of the approach, southeastward, of an area of low pressure from the region north of Manitoba; at York Factory the wind shifted to SE. and the barometer had fallen 0.22 in the past 24 hours. By morning of the 27th the depression appeared central north of Lake Superior, barometer at York Factory indicated a fall of 0.36 inch, wind shifting to W., with light snow; Moose Factory, 29.66, SW., a fall of 0.34 inch in past 24 hours. During the day the depression changed its course to the southeast and by morning of the 28th was central north of Lake Erie; lowest barometers at Alpena and Parry Sound, 29.38 and 29.40, respectively; over the Upper Lake region the winds shifted to W. and NW. increasing to brisk and high accompanied by light rains. 29th, depression central in Maine, lowest barometer at Eastport, 28.77, a fall of 1.10 inches in past 24 hours or 1.16 inches below the normal reading for the month. At midnight the barometer at Sydney, C. B., read 28.73 or 1.16 inches below the normal, a fall of 1.23 inches in past 24 hours. In this vicinity a combination with area No. XX, as heretofore noted, produced a most remarkable change in the pressure and enlarged to a vast extent the area of barometric minima. Inclosed by the isobar of 29.60 the depression covered 20° of latitude and 25° of longitude. In the disposition of pressure over the North Atlantic, Canada and the northeastern portion of the United States a remarkable coincidence occurred on this date, as follows: The isobar of 29.80 inclosed three separate centers of barometric minima between the meridians of 30° and 95° W. and the parallels of 35° and 55° N. The situation and lowest readings of these centres are given as follows: 29.60 in about 46° N. 34° W.; 28.77 at Eastport, Me., and 29.26 at Marquette, Mich. The first and third barometric minima belong to areas No. XIX and No. XXII, respectively. Returning to the position of area No. XXI at Eastport on the morning of the 29th it is found that heavy rains, with high to hurricane southeast to southwest and northwest winds, prevailed over Maine, New Brunswick, Prince Edward Island and Nova Scotia. The highest wind velocities and heaviest rain-falls of the month were experienced on this date at stations in New England and the Canadian Maritime Provinces: Mt. Washington, 132 miles NW.; Newport, R. I., 44 W.; Thatcher's Island, 57 W.; Eastport, 48

NE.; Boston, 39 W.; St. John's, N. B., SE. to NW., strong gales—nothing like this storm for many years; Yarmouth, N. S., strong SE. to NW. gales, terrific squalls; Halifax, SE. to W., violent gales; Port Hastings, N. S., terrific hurricane from SE. to NW.; Louisburg, N. S., heavy ESE. gale veering to S. and WSW.; Cow Bay, N. S., strong SE. to SW. gales; Glace Bay, N. S., heavy SSE. to W. gales; Sydney, N. S., violent SE. gale; Pictou, N. S., strong SW. gale; Charlottetown, P. E. I., heavy NE. to SE. gales; Point du Chene, N. B., heavy SE. to NE. gales—tide suddenly rose three feet, carrying everything before it and causing very great damage; Chatham, N. B., violent E. storm—tide rose suddenly, carrying away bridges and flooding houses; Dalhousie, N. B., fearful gale from the E.; Percé, P. Q., very heavy gale from E. shifting to W.; Father Point, heavy NE. gale, 72 miles per hour; Port Mulgrave, terrific hurricane, doing immense damage to buildings and houses; Hawkesbury, terrific gale from the sea, lasting three hours; Antigonish, terrific gale raged for hours, equalling in violence that of August, 1873; Shelburne, heavy SE. gale; Lockport, extremely violent SW. gale; St. Peters, C. B., as violent as that of August, 1873; Magdalen Islands, violent E. gale, veering to SE. and blowing a perfect hurricane for 12 hours; Broad Cove, C. B., severest gale ever known; New Castle, unusually high tide, flooding lower part of town; Cocagne, tide rose higher than ever known before, rising six feet higher than the highest point during the great storm of August, 1873; Alberton, P. E. I., highest tide ever known. Along the coasts of the Canadian Maritime Provinces over 100 vessels were driven ashore or badly damaged during the storm. The following reports are from vessels along the coast or at sea: Off Nantucket South Shoals, violent NW. gale and heavy cross seas; off Isle Haute, violent squalls and heavy sea; off Sable Island, hurricane from S., veering to E., lasting several hours, followed by a calm, continuing for 15 minutes, when the wind changed to west, blowing with greater violence than before; in 34° N., 70° W. violent SW. gale, lasting six hours with very heavy sea; in 42°, 32' N., 59°, 06' W. cyclone from ESE. to W., with fearful sea; in 40° N., 62° W. hurricane from SW. to W., lasting 12 hours; in 43°, 16' N., 60°, 17' W. violent NNW. to ESE. and W. gales; in 41°, 43' N., 71°, 53' W. S. to WNW. strong gale, heavy sea; in 42°, 15' N., 59°, 49' W. hurricane from S; in 40°, 48' N., 60°, 45' W., heavy cyclone from SSW. backing to SE. and then veering to SSW., lasting two hours, at 6 p. m. had a lull of 30 minutes, barometer rose from 28.60 to 29.10, when a terrific hurricane broke out from the W., sea mountains high, ship completely buried, sails went like a cannon shot, roar of wind was deafening for 2 hours followed by a high westerly gale for 3 days; in 41° N., to 60° W. hurricane from SW. to NW. and continuing for 16 hours; off George's Shoals, heavy gale from SE. to W. and NW., lasting twenty hours; in 44°, 42' N. 60°, 05' W. hurricane at 6.30 a. m.; 9 a. m. vessel thrown on beam ends; in 42°, 20' N., 61°, 50' W., strong gale from SSE. to ESE.; 6 p. m., lull for five minutes when wind suddenly veered to SW. with hurricane force, sea broke completely over the vessel carrying away everything; in 40° N., 63° W., hurricane from SW. to NW., lasting three hours; in 40° N., 60° W., gale from S. to NW., lasting twelve hours; in 37°, 40' N., 62°, 30' W., hurricane from S. veering to WNW. and lasting several hours; in 41°, 58' N., 64°, 29' W., heavy gale from SSE., veering to W. During the 29th this storm passed northward over the Gulf of St. Lawrence, combining on the following morning with area No. XXI then central in the Lower St. Lawrence valley. No. XXII, after the passage of No. XXI eastward to the Province of Ontario by morning of the 28th, the barometer still remained below 29.80 in Manitoba and the extreme Northwest with westerly winds, light rains and snow; lowest barometer 29.73 at Pembina, air calm. Morning of 29th depression central over Lake Superior, lowest barometer 29.26, wind W., at Marquette; following the movement of the area on this day, light rains and snow with brisk to high southwest to northwest winds prevailed in the extreme Northwest, Upper Lake region and Province of Quebec. During the day centre passed rapidly eastward over Canada, and by the following morning was central over the Gulf of St. Lawrence, with the pressure below 29.60 between the meridians of 37° and 80° W., and the parallels of 40° and 55° N.; Father Point, 29.19, W., light rain; Windsor, N. S., 29.17, SW., cloudy; Dalhousie, N. B., 29.20, light rain; in 51° N., 56° W., 29.16, NE., cloudy; steamer *Croft*, on the morning of 30th, while standing off the Banks of Newfoundland, experienced strong breeze from the W., which increased to a hurricane within one hour, sea confused and dangerous, wind shifted to SW. with lightning rapidly and barometer fell from 29.30 to 29.00; 31st, when 100 miles off Sable Island was struck by a most terrific SW. gale, sweeping decks of everything; 30th, in 40° N., 60° W., violent W. gale, lasting for twenty-four hours. Steamer *Blythville*, 30th, off Sable Island, struck cyclone, wind seemed to come from all four points at once, sea running mountain high. In 41° N., 60° W., steamer *France*, 30th, experienced cyclone from SE. to W., with hurricane winds and high sea for thirty-six hours; in 43° N., 44° W., 30th, heavy SW. gale, suddenly shifting to NW. with terrific squalls. 31st, passed northward into Labrador, central area still inclosed by the isobar of 29.20; the barometer at Godthaab as the storm advanced reported a fall of 0.32 inch since the morning of the 30th. The further course of this area will probably appear on the chart for November, 1879. Of the storms over the Atlantic, the following descriptions are given: No. V.—Following the disappearance of area No. I, north of parallel 50° on the 7th, the pressure fell suddenly to the southward and by morning of the 8th a depression of considerable energy appeared in about 45° N., 50° W.; steamer *Hooper*, from Boston to London, experienced heavy gales from NNE.

veering to NE., E., SE. and S.; 9th, wind S. blowing very heavily, sea running mountain high; in 45° N., 45° W. heavy westerly gales lasting until the 12th. During the day depression moved slowly southwestward, while off Newfoundland heavy west and northwest gales prevailed continuing through the 10th. On the 9th, in 45°, 30' N., 48°, 25' W., 29.45, NE., force 6, heavy rain; winds on the eastern coast of Newfoundland shifted from NW. to N. and NE. and the pressure fell from 0.18 to 0.27 inch. 10th, pressure over Newfoundland rose from 0.05 to 0.10 inch, winds still NE. as the storm center passed to the southeastward; in 42°, 35' N., 56°, 20' W., 29.96, NE. force 6, rain; in 45°, 24' N., 50°, 55' W. very severe NE. gale; off Grand Banks, N. F., severe NNE. gale lasting 24 hours; off Banks of Newfoundland, steamer *Plantyn*, violent hurricane from E. veering to W. and lasting 24 hours; bark *Trenton* encountered fearful hurricane, seas mountain high. 11th, the following barometric readings show the extreme limit of the area of low to the east, west and south on this date; St. Johns, N. F., 29.84, NE., light rain; in 36° N., 50° W., 29.82, NW., force 6, rain; in 29° N., 38° W., 29.92, SW., force 6, rain; Angra, Azores, 29.86, S., fair. Reports from vessels at sea are given as follows: in 50°, 37' N., 32°, 29' W., SE. to S., strong gale, high confused sea; in 45°, 24' N., 50°, 56' W., NE., hard gale, high sea; in 43°, 51' N., 48°, 15' W., SE. to W., stormy, very high sea; in 44°, 13' N., 50°, 04' W. northerly gale; in 41°, 50' N., 58°, 10' W., schooner *Henry Lippett*, terrific gale from NE. changing to NW., lasting for five days, had to run S. to 33° N. before vessel was righted. 12th, in 35° N., 48° W., 29.63, NW., force 4; in 33° N., 37°, 40' W., 29.80, S. force 6, rain; in 37°, 45' N., 62° W., 29.92, force 6, cloudy; St. Johns, N. F., 29.74, NW., stormy; Angra, Azores, 30.06, SSW., fair; in 44°, 46' N., 53°, 53' W., N. hard gale, high sea; in 43° N., 53°, 42' W., N. heavy storm; in 48°, 55' N., 40°, 50' W., SSE, squally, high sea; in 42°, 57' N., 54°, 50' W., fresh northeasterly gales. During the day this depression probably disappeared in an area of high pressure (30.40) central morning of the 13th northeast of the Azores. Following the disappearance of area No. V the pressure fell with considerable suddenness in the vicinity of 45° N., 50° W., the central area being inclosed within the isobar of 29.40 on the morning of the 13th. This area is not charted owing to the extreme irregularity of its course; so far as our charts would present reliable data the course of the area was circular, returning frequently upon itself, or perhaps more strictly, it was about stationary. This peculiar condition continued from the 13th to 20th, and was very likely due to the persistent constancy of an area of high pressure (30.40) which prevailed off the western coast of Europe and from which there was no relief until the morning of the 21st. 13th, in 36°, 35' N., 37°, 38' W., 29.86, SSW., force 6, heavy rain; in 34° N., 46° W., 29.77, NW., force 4, cloudy; in 37°, 40' N., 60°, 15' W., 29.87, N., force 6, cloudy; St. Johns, N. F., 29.47, W. fair; St. Pierre, N. F., 29.44, N.; in 43°, 02' N., 59°, 59' W., N. to NW., fresh gale, high sea; in 47°, 13' N., 47°, 51' W., SSE. to W., strong gale, squally, high sea. 14th, St. Johns, N. F., 29.46, SW. cloudy; St. Pierre, N. F., 29.35, W.; Sydney, C. B., 29.57, NW.; in 38° N., 57° W., 29.74, WNW., force 6, cloudy. 15th, St. John's, 29.64, S., fair; St. Pierre, 29.48, NW.; Sydney, C. B., 29.73, N., cloudy; in 39°, 40' N., 53°, 15' W., 29.67, SW., force 6; in 37° N., 57° W., 29.90, NW., force 4, cloudy. 16th, St. John's, 29.82, NW., fair; St. Pierre, 29.47, NE.; in 40°, 15' N., 50°, 10' W., 29.68, W., rain; in 47°, 30' N., 41°, 40' W., 29.78, S., cloudy. 17th, depression apparently central in 45° N., 45° W.; in 45°, 40' N., 48°, 30' W., 29.74, SW., cloudy; in 47°, 15' N., 43°, 25' W., 29.78, W., rain; in 42° N., 48°, 50' W., 29.87, NW., cloudy. 18th, probably central near 40° N., 50° W.; in 46° N., 50° W., 29.90, S., cloudy; in 42° N., 49° W., 29.64, NNW., force 6, heavy rain; in 45°, 40' N., 38°, 45' W., 30.00, NNE., force 6, heavy rain; in 41° N., 55° W., 29.80, NW., threatening; in 41° N., 47° W., revolving storm, veering from ENE. by N. to SW., blowing with terrific violence, heavy rain, high cross-seas. 19th, probably central in 44° N., 45° W.; in 41°, 35' N., 46°, 40' W., 29.75, SSE., fair; during this and the following day combined with area No. IX, then moving southeastward from the Canadian Maritime Provinces. No. XIX.—On the 26th as area No. XVII appeared central in about 60° N., 40° W., a very narrow barometric trough of 29.90 extended south-southwest to about 35° N., 50° W. On either side of this contracted area of low, were situated two areas of extremely high pressure, 30.40 in 47° N., 30° W. and 30.80 over the Middle Atlantic states. On the 27th these two areas of high pressure were rapidly dissipated by the counteracting influence of no less than five separate areas of barometric minima between the meridians of 10° and 90° W. and the parallels of 20° and 70° N. Their respective positions can be ascertained by referring to the charting of areas No. XVII, XIX, XX, XXI and XXIII. By the morning of the 27th an area of 29.60 appeared in about 40° N., 50° W.; in 43°, 30' N., 46°, 25' W., 29.59, ESE., force 4, rain; 28th, in 44°, 35' N., 45° W., 29.50, N., fair; in 41°, 11' N., 57°, 21' W., steamship *Abana*, reported, noon, barometer 30.17, wind S., sea calm, clear during evening, at midnight 29.80 increasing southerly wind; 29th, 4 a. m., heavy gales from E. and S., rain in torrents, barometer 29.00, ship unmanageable on account of wind; 7 a. m., wind backed to E.; 8.30 a. m., violent hurricane increasing in force, barometer gradually fell to 28.50; 9 a. m., barometer 28.00; 9.25 a. m., suddenly calm for 15 minutes, the stillness being very oppressive, wind previously from the east now began to blow from the west with increased violence, no object visible at more than 20 feet distant, ship unmanageable; 9.50 a. m., wind WSW., heavy gale, barometer rose 0.50 inch in 90 minutes, wind continued WSW. until 6 p. m., when it hauled round to W., barometer, 29.20; gales from W. and NW., continued to 7 a. m. of the 30th, after which the vessel passed into an area of

high pressure (30.20) with clearing weather but a continuance of northwesterly gales. The central area of barometric minima on this day (28th) extended from near 50° N., 50° W., west-southwest to the position of area No. XX, off the North Carolina coast. Although this elongated area of low pressure is not clearly delineated upon our daily charts, reports from the logs of vessels show the barometer to have reached a very low point and the winds to have been exceedingly severe. 29th, in 45° N., 41° , $30'$ W., 29.61, W., force 7, rain; in 49° , $01'$ N., 33° , $14'$ W., NE. to SE., stormy, high seas; in 51° , $24'$ N., 38° , $36'$ W., SE., gale; in 47° , $45'$ N., 42° , $34'$ W., SE., moderate storm, rain, high sea. During the day depression lost its identity through the overwhelming influence of areas No. XXII and XXIII, central respectively over the Gulf of St. Lawrence and between the Azores and Maderia Islands. No. XXIII.—Resulting from the extensive area of barometric minima which on the 30th prevailed from Hudson's Bay southeastward to the northwestern coast of Africa, the isobar of 29.80 inclosed the central area. At Funchal the barometer in the past 24 hours fell 0.10 inch, and at Ponta Delgado 0.21 inch; on the western coast of Spain and Portugal there was a rise of 0.07 to 0.13 inch with winds shifting from NE. to S. and SE. 31st, central off the western coast of Spain and Portugal, winds backing to SE. and E. with rising pressure at land stations, rainy and threatening weather becoming general. Of the storms over the Atlantic, north of parallel 60° and over northern Europe, the following descriptions are given: No. II.—This storm is a continuation of area No. XXI of the September, 1879, chart. Central south of Iceland on the 1st, it moved northeastward north of the Faroe Islands during that day and the following, barometer at Stykkisholm, 29.27, wind N.; Thorshavn, 29.25, SSE., a fall of 0.58 inch in past 24 hours; Monach Light-house, 29.37, SW., a fall of 0.50 inch in past 24 hours; North Unst, 29.49, SSE., a fall of 0.55 inch. 2nd, Stykkisholm, 29.16, NW.; Thorshavn, 29.31, SSE.; Monach Light-house, 29.43, SW.; North Unst, 29.53, S. 3rd, Stykkisholm, 29.54, ENE.; Thorshavn, 29.23, WNW.; North Unst, 29.24, SSW.; pressure along the coast of Norway fell from 0.15 to 0.25 inch, with winds shifting to SW. and SE. During the day depression passed southeastward into southern Scandinavia, accompanied to the southward over Denmark and along the southern shores of the White Sea by northwesterly gales and light rains. 4th, pressure at centre generally below 29.60. 5th, central over the Gulf of Bothnia near 60° N., 20° E., with increased pressure, barometer at center below 29.80; rain prevailed at most Gulf stations with NE., S., SW. and NW. winds. 6th, central over Lapland, followed over the Gulf of Bothnia by rising pressure, northwesterly winds and clearing weather; Tromso, 29.62, SW., a fall of 0.18 inch in past 24 hours; Archangel, 29.81, S., a fall of 0.27 inch in past 24 hours. 7th, depression about stationary, disappearing by morning of the 8th north of the White Sea. No. VII.—Following the disappearance of area No. II, the pressure fell suddenly over northern Scandinavia and Lapland. 9th, Tromso, 29.59, SW. rain, a fall of 0.20 inch in the past 24 hours; Archangel, 29.72, SSW. rain, a fall of 0.22 inch in past 24 hours. 10th, central over the White Sea, with a barometric trough (29.60), extending south to parallel 50° N.; Archangel, 29.54, SSW. rain; Tromso, 29.73, calm, rain; St. Petersburg, 29.58, S. rain. 11th, central southeast of the Gulf of Finland; Moscow, 29.58, NNW.; St. Petersburg, 29.80, NE.; Dorpat, 29.87, NW.; Kieff, 29.63, ESE.; Lugan, 29.78, SW. rain. 12th, depression curved to the northeast with lowest pressure again at Archangel, 29.54, NW. a fall of 0.31 inch in past 24 hours; winds over central Russia shifted to S. and SW. 13th, lowest pressure at Kasan 29.46, a fall of 0.20 inch in past 24 hours, wind SSE; Krotkovo, 29.47, S. a fall of 0.31 inch. During the day this area dissipated under the influence of No. X, central over the Gulf of Finland, and an area of high pressure (30.30) over western Siberia. The irregularity of the movement of this area (No. VII) since the 11th, was probably due to the constant high pressure over western Siberia. No. X.—On the morning of the 13th, there was an extremely sudden fall of the barometer in northern Scandinavia; Umea, 28.88, a fall of 1.00 inch in past 24 hours, wind SW.; Hernosand, 28.91, a fall of 1.02 inch, wind SW.; Haparanda, 29.06, a fall of 0.76 inch, wind, NE., light snow; Brono, 29.10, a fall of 0.80 inch, wind, NNW., 29 miles per hour. 14th, depression central near St. Petersburg, barometer 28.72, a fall of 0.86 inch in past 24 hours, wind WSW.; Dorpat, 29.02, NW; Archangel 29.26, ENE.; Moscow, 29.15, SE. 15th, depression about stationary with rapidly increasing pressure; St. Petersburg, 29.10, NW; Dorpat 29.26, WNW; Archangel 30.07, NE; Moscow, 29.35, S. By morning of the 16th, the depression had moved northeastward being central east of the White Sea; Archangel 29.27, NW.; Ekaterinburg, 29.30, a fall of 0.29 inch in past twenty-four hours, wind S. 17th, central in the valley of the Obi, followed by a rise of 0.46 inch at Ekaterinburg, wind shifting to W. 18th, central in the valley of the Yenisei, north of parallel 60° N; Yeniseisk, 29.77, a fall of 0.22 inch in past twenty-four hours, wind shifting from E. to S.; Barnaul, 29.97, a fall of 0.08 inch in past twenty-four hours, wind SW. During the day area disappeared to the eastward over northern Siberia. No. XII.—On the 16th, a small area of 29.60 appeared south of Iceland; Stykkisholm, 29.73, a fall of 0.44 inch in past twenty-four hours, wind shifted from SE. to NE., with rain; Thorshavn, 29.61, a fall of 0.78 inch in the past twenty-four hours, wind shifted from N. to S. 17th, depression passed rapidly northeastward to the Norway coast; Thorshavn, 28.81, N.; Brono, 29.13, a fall of 0.67 inch in past twenty-four hours, S., rain; Bergen, 29.37, a fall of 0.75 inch in past twenty-four hours, S., rain; Tromso, 29.35, a fall of 0.25 inch in past twenty-four hours, NE., cloudy; Christiania, 29.45, a fall of 0.69 inch in past twenty-four hours, SW., rain; the

winds over the British Isles shifted to N. and NW., with increased force and rapidly falling pressure, the latter, owing to the formation of a barometric trough extending from Lapland southwestward to the Bay of Biscay. 18th, with enlarged area the depression became central south of the Gulf of Finland; Dorpat, 29.35, a fall of 0.67 inch in past twenty-four hours, ENE., heavy snow; St. Petersburg, 29.47, a fall of 0.51 inch, E., snow; Wilna, 29.27, a fall of 0.70 inch, NW., threatening; Kieff, 29.47, a fall of 0.21 inch, WNW., light rain; Moscow, 29.39, a fall of 0.78 inch, SE., rain. 19th, on this date the isobar of 29.80 covered the whole of Europe north of the 50th parallel, area No. XIII being central southeast of Iceland and No. XII between the Gulf of Finland and the White Sea. Archangel, 29.21, a fall of 0.66 inch in past twenty-four hours, E., snow; St. Petersburg, 29.13, W., snow; Dorpat, 29.35, stationary, W., snow. During the day the depression disappeared east of the White Sea under the influence of a high area over western Siberia. No. XIII. On the 17th, the barometer at Stykkisholm rose 0.18 inch, wind veered from NE. to E. after the passage of area No. XII. At Godthaab, barometer rose slightly, wind veered from NE. to S. 18th, Stykkisholm, 28.83, a fall of 1.08 inches in past twenty-four hours, SE., force 8, rain; Godthaab, 29.61, a fall of 0.20 inch in past twenty-four hours, SW., cloudy; Thorshavn, 29.65, SSE., a fall of 0.17 inch. 19th, Stykkisholm, 28.87, WSW., rain; Godthaab, 29.42, N., cloudy; Thorshavn, 28.78, NW.; North Unst, 28.72, a fall of 1.04 inches in past 24 hours, W., force 6; Monach Light-house, 28.98, W., force 6, a fall of 0.78 inch. 20th, pressure below 29.80 over the whole of Europe north of the 45th parallel; area central over southern Scandinavia inclosed by the isobar of 28.80; Bergen, 28.72, NNW., a fall of 0.25 inch in past 24 hours; Brono, 29.01, E., a fall of 0.21 inch; Christiania, 28.76, S., a fall of 0.51 inch; Upsala, 28.76, SSW., a fall of 0.59 inch in past 24 hours; Vestervig, 28.81, a fall of 0.38 inch, W., rain; over Denmark the pressure was below 29.00, winds southwesterly. 21st, depression central over the Gulf of Bothnia, with considerably diminished pressure, the isobar of 29.20 inclosing the central area; lowest barometer at Wisby, 29.07, WNW.; clearing weather, with SW. to NW. winds and rising pressure, prevailed over the British Isles and central Europe. 22nd, central over Finland; Archangel, 29.41, S.; St. Petersburg, 29.48, S.; Haparanda, 29.44, N.; Umea, 29.45, N.; Hernosand, 29.50, NW.; Dorpat, 29.53, S., rain. During the day disappeared east of the White Sea in a high pressure area over western Siberia. No. XIV.—Following the passage of No. XIII the barometer, at Stykkisholm on the 20th, rose 0.69 inch, winds shifting from W. to E., but by morning of the 21st there was a fall of 0.21 inch reported, wind S, rain. 22nd, depression central off the coast of Norway; Brono, 29.24, S., a fall of 0.17 inch in past 24 hours; Tromso, 29.34, SW.; Haparanda, 29.44, N.; on this day the centres of the two areas, Nos. XIII and XIV, were on nearly the same parallel and within 20° of longitude. 23rd, depression central over Finland; Umea, 29.13, N.; Haparanda, 29.26, N.; Hernosand, 29.25, WNW.; St. Petersburg, 29.31, SW.; Dorpat, 29.47, SW. 24th, central over the White Sea; Archangel, 29.34, W., a fall of 0.11 inch; during the day passed southeastward into northwestern Siberia. 25th, Ekaterinburg, 29.87, NW, a fall of 0.11 inch in past 24 hours; area passed slowly southeastward over the valley of the Obi and by morning of the 26th, Barnaul barometer read 29.82, or a fall of 0.33 inch, wind shifted from NW. to S.; Yeniseisk, 29.89, a fall of 0.46 inch, wind shifted to SE. 27th, Barnaul 29.65, NW., threatening; Yeniseisk, 29.78, S., rain. 28th, Barnaul, 30.24, SW., snow; Yeniseisk, 30.11, W., cloudy. No. XV.—On the 21st the barometer at Godthaab read 29.34, a fall of 0.14 inch in past 24 hours, wind veering to E., from N. on the 19th and NNE. on the 20th. 22nd, Godthaab, 29.25, wind backed to NW.; Stykkisholm, 29.74, E., force 8, a rise of 0.39 inch in past 24 hours. 23rd, Godthaab, 29.87, SW.; Stykkisholm, 29.25, SE., rain. During the day the depression moved rapidly eastward and by morning of the 24th was central north of the Shetland Isles. Thorshavn, 29.33 W.; North Unst, 29.42, NW.; Bergen, 29.47, S., rain; Brono, 29.56, calm; Tromso, 29.57, calm. 25th, central over the North Sea; winds over the British Isles from NE. to W.; over northern France, Germany and Denmark W. to SE., pressure generally below 29.80, central area below 29.60. During the day the depression probably disappeared over Germany through the influence of approaching high areas to the east and west, 30.60 north of the Azores and 30.20 over central Russia. Had our daily charts reported the distribution of atmospheric pressure for more than one hour of the day it is more than probable that area No. XVIII would prove to be but a continuation of No. XV. No. XVIII. The peculiar course of this probably separate area appeared to be due to the encroachment of high-pressure areas situated to the east and west. On the morning of the 26th the barometer fell very suddenly over the Bay of Biscay, followed by the appearance of an area of 29.60 off the northern coast of Spain; rain, with southerly winds, commenced at Spanish stations on the 26th, continuing throughout the remainder of the month. 26th, Santiago, 29.61, SE. rain, a fall of 0.40 inch in past 24 hours; Bilbao, 29.78, S., cloudy, a fall of 0.24 inch in past 24 hours; along the coast of France there was a fall of 0.05 to 0.08 inch, winds shifting from W. to SE. and E.; Lisbon, 29.85, SW., a fall of 0.13 inch in past 24 hours. 27th, Santiago, 29.69, SSE.; Lisbon, 29.67, S., rain; Campo Major, 29.82, SE., rain. During the day the high areas previously spoken of as situated to the east and west combined to the northward over Europe between the parallels of 50° and 60° N., forming an area of 30.40. Throughout the 28th and 29th the depression remained about stationary over Portugal and western Spain, accompanied by southerly winds and rain; by

morning of the 30th had disappeared to the eastward in an area of high pressure, 30.20, followed to the westward by slowly rising pressure and southeasterly winds, the latter owing to the advance of area No. XXIII from the southwest. Of the storms over southern Europe the following descriptions are given: No. VI.—While area No. II appeared central near the White Sea on the 7th, the pressure fell considerably over that portion of Russia just north of the Black Sea, forming by morning of the 8th an area of 29.80; Kieff, 29.71, WNW., a fall of 0.24 inch in past 24 hours; Nikolaiev, 29.85, W., a fall of 0.23 inch; Lugan, 29.79, calm, a fall of 0.21 inch. 9th, depression about stationary; Kieff, 29.82, NE; Nikolaiev, 29.89, S; Lugan, 29.81, NE.* 10th, Kieff, 29.77, NW.; Nikolaiev, 29.84, NNW.; Lugan, 29.68, E. During the day area No. VII, then central over the White Sea, formed a barometric trough of 29.60, which extended southward to parallel 50° N., with which, by morning of the 11th, area No. VI combined; lowest barometer at Moscow, 29.58, NW., a fall of 0.20 inch in past 24 hours. No. XI.—During the 14th there was a fall in pressure of from 0.25 to 0.35 inch over Switzerland and northern Italy, winds S. and SW, accompanied by light to heavy rains, pressure generally below 29.80. By morning of the 16th a decided depression had formed over the central portion of Italy inclosed within the isobar of 29.60; Leghorn, 29.38, W., a fall of 0.48 inch in past 24 hours; Pesaro, 29.39, SW., a fall of 0.41 inch; Genoa, 29.41, N., a fall of 0.37 inch; Florence, 29.42, W., a fall of 0.42 inch. 17th, with rising pressure, clearing weather and northerly winds the central area passed eastward into northern Turkey; Hermannstadt, 29.42, NW., rain, a fall of 0.32 inch in past 24 hours; Constantinople, 29.63, SSW., a fall of 0.39 inch; Valona, 29.83, S. cloudy, 1.85 inches rain-fall in past 24 hours. 18th, depression central in eastern Austria; Lemberg, 29.59, NW., hailstorm, 2.01 inches rain-fall in past 24 hours; Hermannstadt, 29.85, WNW.; Szathmar, 29.80, SW.; Szegedin, 29.80, W. During the day this depression lost its identity over western Russia through the influence of area No. XII then passing to the eastward near the Gulf of Finland, but on that day the isobar of 29.60 extended southward to the Black Sea and covered nearly the whole of central Europe. No. XVI.—The powerfully disturbing effects of area No. XIII, particularly on the 20th and 21st, causing the lowest barometric readings of the month over Europe, appeared to be instrumental in the formation of another depression over Italy. On the morning of the 21st the barometer indicated a fall of from 0.25 to 0.50 inch in past 24 hours at northern stations, the central area being inclosed by the isobar of 29.60; lowest barometer, 29.51 at Leghorn; rainfall quite general. 22d, with increased pressure, the central area (29.80) covered the southern half of the kingdom; winds variable, lowest barometer 29.58 at Cosenza, 1.07 inches rainfall in past 24 hours. 23d, central in the valley of the Danube, accompanied by quite general rains, with northwesterly winds over Austria and southeasterly winds over Turkey. Over Italy northerly winds and clearing weather prevailed. By morning of the 24th depression had disappeared to the eastward in an area of high pressure, 30.20, prevailing in the vicinity of the Caspian Sea. No storms have been charted on the Asiatic coast, although this month is one (last one) of the four comprising the typhoon season of the China and Japan seas. There are some reports from the logs of vessels which indicate the presence of these storms, but the data is irregular and the stations on the Asiatic coast are so few from which reports are regularly received, that it is not deemed advisable to attempt the indication of storm tracks on the chart, and the following disconnected data is furnished, principally from the reports of vessels: Steamship *Gaelic*, Hong Kong, 8th, 29.59, NE., force 8 to 9; 9th, 29.80, NNE., force 2; 10th, 29.91, NE., force 5, heavy squalls at intervals. Hong Kong, 9th, typhoon a little to the south; at 4.30 p. m., 29.32, typhoon probably moved from SE. to NW. Manilla, 7th, 29.70, WSW; 8th, 29.79, S. Zi-Ka-Wei, 23th, between 4.45 and 5.00 a. m., typhoon passed over station, wind shifted from ESE. to WNW., lowest barometer 29.76. Macao, 26th, 29.97 a fall of 0.11 inch in past twenty-four hours, wind shifted from SE. to S. Hong Kong, 25th, heavy NE. gale. Manilla, 26th, 29.81, NE. Steamship *Gaelic*, 23d, in 25°, 18' N., 119°, 59' E., 30.10, N., force 5, rough sea, threatening; 24th, in 27°, 04' N., 124°, 01' E., 29.90, SSE., force 4, moderate sea, threatening; 25th, in 28°, 56' N., 128°, 31' E., 29.82, W., force 5, rough sea, rain; 26th, in 30°, 29' N., 133°, 11' E., 30.00, NW., force 5, rough sea, squally. Nagasaki, 26th, 29.66, a fall of 0.45 inch in past twenty-four hours, wind shifted from N. to W., rainfall 1.86 inches; 27th, 30.00, NW., cloudy. Hiroshima, 26th, 29.80, a fall of 0.35 inch in past twenty-four hours, wind shifted from ENE. to NNE, rainfall 1.30 inches; 27th, 29.91, NNW., clear. Tokai, 26th, 30.10 a rise of 0.07 inch in past twenty-four hours, wind shifted from NNW. to N., rainfall 1.58 inches; 27th, 29.64, N., rainfall 1.08 inches. Waykayama, 26th, 29.91, a fall of 0.22 inch in past twenty-four hours, wind shifted from NE. to ENE., rainfall 5.59 inches; 27th, 29.83, N., cloudy. On the 28th a pressure of from 30.03 to 30.17 covered the Japan Islands, winds shifting to SW. and NW. with clearing weather. It seems very probable from a study of the daily charts since the 24th, notwithstanding the scarcity of data, that a typhoon appeared on that date over the China Sea, south of Hong Kong, pursuing thereafter a northeasterly course, hugging the coast closely, perhaps crossing the Island of Formosa, and after reaching the latitude of the Lew Chew Islands curved more to the east, then again to the northeast, passing off the Bay of Yeddo on the 27th. It will be seen from the following record of maximum readings for the month over

the Japan Islands and along the Asiatic coast from 25° to 50° N., that few typhoons could have pursued their customary paths between these parallels: 1st, 30.27; 2d, 30.29; 3d, 30.33; 4th, 30.52; 5th, 30.34; 6th, 30.25; 7th, 30.25; 8th, 30.29; 9th, 30.44; 10th, 30.39; 11th, 30.24; 12th, 30.20; 13th, 30.24; 14th, 30.27; 15th, 30.34; 16th, 30.33; 17th, 30.33; 18th, 30.26; 19th, 30.22; 20th, 30.26; 21st, 30.21; 22d, 30.27; 23d, 30.21; 24th, 30.22; 25th, 30.15; 26th, 30.10; 27th, 30.22; 28th, 30.32; 29th, 30.32; 30th, 30.32; 31st, 30.28. Over the China Sea and Phillipine Islands, the development and passage of typhoons may have occurred with the usual frequency, but little can now be said regarding that probability, owing to the extreme paucity of reports from these localities.

TEMPERATURE OF THE AIR.

The mean temperature of the air for September, 1881, is shown by the isothermal lines (in red) on Chart No. II. The table of mean and comparative temperatures in the right-hand corner of the chart shows, in the first column, the average for the month throughout the various districts, as deduced principally from observations taken at Signal Service stations. In the two remaining columns are shown the means for the present month and the departures of such means from the average for many years. South and east of a line extending southwestward from Lake Michigan to New Mexico, the temperature is everywhere above the normal. The excess ranges from about normal in the Florida peninsula and Rio Grande valley to 8°.9 in the Lower Lake region. There is a slight excess reported from the Southern Pacific Coast region. The mean temperature of the present month is remarkably high over the eastern portion of the country. In comparison with previous years the departures from normal are found to be the largest by from 2° to 3°, that have occurred since the establishment of Signal Service stations. The region of greatest excess (from +5.7 to +8°.9) is embraced by the following districts: Upper Mississippi valley, Ohio valley and Tennessee, Middle Atlantic states and the Lower Lake region. Since 1872, the following are the maximum departures of excess, with corresponding districts: 1873, +0°.6, West Gulf states; 1874, +5°.8 and +4°.7, Upper and Lower Lakes, respectively; 1875, all deficiencies; 1876, all deficiencies; 1877, +5°.9 and +4°.6, in the Upper Missouri and Upper Mississippi valleys, respectively; 1878, +3°.6, Upper Lakes; 1879, +5°.8, Western Plateau; 1880, +1°.8 and +1°.9, in New England and the Northern Plateau, respectively. Throughout the Plateau and in the Middle and Northern Pacific Coast regions, in Minnesota and the Missouri valley, the temperature is below the average, the deficiency ranging from -0°.8 in Minnesota to -5°.1 in the Northern Plateau.

Ranges of Temperature at Signal Service stations.—Monthly ranges in general varied from 25° to 40° over the country east of the Rocky Mountains and from 45° to 60° to the westward of that region. The *smallest* ranges were: Punta Rassa, 20°; Key West, 21°; Portsmouth, N. C., 22°; Hatteras and Fort Macon, 23°; Port Eads, 24°; Charleston, Savannah, Galveston and Jacksonville, 25°; Cedar Keys, Charlotte, Smithville and Wood's Holl, 26°; Chincoteague, 27°; Cape Henry and Norfolk, 28°. The *largest* were: Ft. Gibson, 73°; North Platte, 72°; Eagle Rock, 69°; Winnemucca, 68°; Fort Bennett and Campo, 65°; Yankton, 64°. The *daily* ranges varied in the different districts as follows: New England, 15° at New Shoreham to 33° at Thatcher's Island; Middle Atlantic states, 19° at Atlantic City to 35° at Sandy Hook and Washington; South Atlantic states, 15° at Charleston and Portsmouth to 24° at Augusta; Florida Peninsula, 17° at Key West to 19° at Cedar Keys; Eastern Gulf states, 20° at Pensacola to 29° at Vicksburg; Western Gulf States, 13° at Port Eads and 16° at Galveston to 38° at Shreveport and 47° at Fort Gibson; Ohio valley and Tennessee, 22° at Cincinnati to 32° at Knoxville and Champaign; Lower Lake region, 24° at Toledo to 31° at Buffalo; Upper Lake region, 25° at Grand Haven and Escanaba to 32° at Chicago; Upper Mississippi valley, 27° at Cairo to 35° at Dubuque and 44° at St. Paul; Missouri valley, 32° at Leavenworth to 42° at Fort Bennett; extreme Northwest, 34° at Moorehead to 45° at Fort Buford; Northern Slope, 40° at Cheyenne to 50° at Fort Keogh and North Platte; Middle Slope, 47° at Fort Elliott to 41° at Denver and 45° at Dodge City; Southern Slope, 24° at Henrietta to 39° at Concho and 44° at El Paso; Rio Grande valley, 27° at Brownsville to 36° at Rio Grande and 38° at Castroville; Northern Plateau, 40° Lewiston to 47° at Missoula; Middle Plateau, 32° at Salt Lake City, 35° at Pioche and 57° at Winnemucca; Southern Plateau, 25° at Fort Grant to 45° at Prescott and 46° at La Mesilla; North Pacific coast, 35° at Olympia to 44° at Roseburg; Middle Pacific coast, 22° at San Francisco to 38° at Sacramento; Southern Pacific coast, 23° at San Diego to 45° at Los Angeles and 55° at Campo.

Deviations from Mean Temperatures.—Under this heading departures exhibited by the reports from the regular Signal Service stations are shown in the table of comparative temperatures on the right-hand side of chart No. II. The following items of importance in connection with this subject are reported by voluntary observers: *Connecticut*: Southington, month marked by extreme heat; mean temperature far above the average; higher than the mean of August for the past six years, and the mean of June for the past twelve years, being nearly equal to the mean of the warm July of 1875. *Illinois*: Rockford, mean temperature considerably above the average. *Iowa*: Clinton, mean temperature 7°.8 above the mean for 1880 and 9°.9 above the mean for 1879; first September for many years without frost. *Kansas*: Lawrence, mean temperature 4°.8 above